

REMARKS

I. Introduction

The pending claim, independent claim 1, stands rejected under 35 U.S.C. §112, second paragraph, for indefiniteness for the multiple informalities identified in the August 24, 2004 Office Action. In response, Applicants have amended the pending claim to address the specific informalities identified by the Examiner and reconsideration of the indefiniteness rejections under 35 U.S.C. §112, second paragraph, is respectfully requested.

The pending claim further stands rejected under 35 U.S.C. §103(a) for obviousness over European reference no. 1 170 214 to Shibasaki (U.S. Patent No. 5,414,980) in view of U.S. Patent No. 5,379,676 to Koyama. In view of the following remarks, Applicants respectfully request reconsideration of the Examiner's obviousness rejection over the cited references.

II. The Claimed Invention (Independent Claim 1)

The claimed invention as set forth in pending independent claim 1 provides an automatic banding packing machine capable of easily removing the ring of a band with a simple structure when idle banding is carried out. In order to accomplish this result, when the rear end side of the band is to be pulled back by the band pull-back means, an amount of the pull-back is detected by detecting means. In addition, idle banding of the band is carried out when a length of the band thus pulled back is greater than a preset length of the pull-back of the band corresponding to a minimum packed article that can be packed. Furthermore, rotation of the cam shaft is temporarily stopped based on this signal so that the timing of the pressing to be carried out by the middle presser member after melting the superposing portion of the band by means of the heater is delayed for a predetermined time.

According to the present invention, when the idle banding of the band is detected, the surface of the band is still heated by the heater. Thereafter, the rotation of the cam shaft is stopped temporarily. By such a structure, the time required for cooling the surface of the band molten by the heating is maintained. As a result, with the same structure as before, the band can be prevented from being welded without another member, even if the pressing is carried out by means of the middle presser member after heating the band. In the case in which the idle banding

is carried out, the band wound around the slide table jumps outward by elastic force thereof, if the middle presser member pressing the lower surface of the band or the like is released from the band.

Furthermore, in the automatic banding packing machine, according to the present embodiment, after the band is fed to the band guide arch (74) by the band feeding means (82), the length of the band pulled back is detected by detecting means which will be described below. More specifically, in order to detect the length of the band pulled back by the band pull-back means (84) after feeding, the following steps may be followed. Namely, for example, the tip portion of the band is wound like a loop around the band guide arch (74) as shown in FIG. 2 and then abuts on a stopper (61) of a band guide (60) which can freely appear on a band running path in an almost horizontal direction, and by this abutment, a limit switch is turned ON. After the limit switch is turned ON by detecting the number of rotations of the touch roller (88) coming in contact with the reverse rotating roller (94) of the band pull-back means (84) by pressure, the above length of the band pulled back can be detected. If the number of rotations of the touch roller (88) is thus detected and converted into a length, the amount of the band pulled back can be confirmed. Consequently, it is possible to decide whether normal pull-back or idle banding is carried out in the execution of the banding.

Referring to the amount of the pull-back, in the case in which the length of the band pulled back in an actual banding work is greater than a preset length, that is, the length of the amount of the pull-back corresponding to a minimum packed article which can be packed in the automatic banding packing machine, idle banding of the band is carried out. In the case in which the execution of the idle banding is detected by such detecting means, a signal is output to a control device for controlling the control portion (83).

In the present invention, an idle banding signal is detected by the detecting means as described previously. Consequently, the tightening is cancelled or is carried out in a constant amount based on the signal and the band (B) is then heated by the heater (36) for a predetermined time, and the cam shaft (41) is temporarily stopped. In the present invention, when the rotation of the cam shaft (41) is temporarily stopped, as shown in FIG. 6, a time taken for the middle presser member (6), which is provided below the heater (36), to be lifted from the lower position toward the heater (36) is maintained to be longer than usual. Therefore, even if the heater (36) is inserted and the surface of the band is molten by the heater (36), the rotation of the cam shaft (41) is then stopped temporarily. As a result, the surface of the band (B) molten by the heater (36)

is cooled before the middle presser member (6) is successively lifted. Thereafter, the middle presser member (6) is moved upward as usual.

Thus, in the present invention, the rotation of the cam shaft (41) is temporarily stopped when the idle banding is detected. Even if the surface of the band is heated by the heater (36), the surface of the band is cooled before the middle presser member (6) is lifted to carry out pressing again. Accordingly, the surface of the band is cooled before the pressing step by the middle presser member (6). When the heated and molten portion of the band is pressed by the middle presser member (6) in such a state, the band can be prevented from being bonded. Thus, in the case in which idle banding is caused, the band is caused to jump outward by the elastic force thereof in the state of FIG. 7 (jump-out).

III. The Shibasaki reference (U.S. Patent No, 5,414,980; EP 170214)

An automatic banding packing machine is disclosed in Shibasaki. As shown in FIGS. 4-7, the disclosed conventional cam structure includes a left presser member (26), a middle presser member (28), a cutter (29), and a right presser member (25), a heater (27), and an upper press board (9). However, in Shibasaki, when the rear end side of the band is to be pulled back by the band pull-back means, an amount of the pull-back is not detected by detecting means in contrast to the present invention. In addition, in Shibasaki, it is not decided that idle banding of the band is carried out when a length of the band thus pulled back is greater than a preset length of the pull-back of the band corresponding to a minimum packed article which can be packed, again in contrast to the present invention.

Furthermore, contrary to the present invention, in Shibasaki the rotation of the cam shaft is not temporarily stopped based on this signal so that the timing of the pressing to be carried out by the middle presser member after melting the superposing portion of the band by means of the heater is not delayed for a predetermined time. That is, Shibasaki is exactly the automatic banding packing machine of the conventional technology shown in FIGS. 8 and 9 of the present application, which includes the problems to be solved in the present invention. Specifically, the conventional automatic banding packing machine of Shibasaki has the following defects.

For example, if the banding work is carried out in a state in which an article (M) to be packed is not put on the upper surface of the packing machine body (21), that is, the slide table (34), the band (B) forms a small ring and is directly wound around the slide table (34). Also,

in the case in which the article (M) to be packed is not present, or a starting switch is pressed by mistake, such idle banding is carried out. In that case, the ring of the band has to be cut away from the slide table (34). However, such a band (B) is tightly wound around the slide table (34). Therefore, there is a problem in that scissors must be used and the tips of which enter with difficulty so that a great deal of time and labor is required. Therefore, when idle banding is performed in the automatic banding packing machine of Shibasaki, it is not possible to easily remove the ring of a band since the band is welded.

IV. The Koyama patent (US. Patent No. 5,379,576)

In Koyama, with reference to the automatic banding packing machine disclosed therein, detecting reduction of the number of rotations of the inversion touch roller (13) is disclosed. However, in Koyama, the number of rotations of the inversion touch roller (13) decreases, and a band is strongly wound to an article to be packed by the setting time expiration signal of the timer which inputted the signal that detects the number decreases of the inversion touch roller (13). Then, tightening is completed by the setting time expiration signal of a timer.

Moreover, by this signal, the cam axis (4) rotates and a band supply end side is gripped. The welding of the band bonding part by the band welding mechanism (50) is performed by the cam axis (4), which continues rotation. Then, each known process of cutting by the side of a supply end is completed. That is to say, in the automatic banding packing machine of the conventional technology shown in FIGS. 8 and 9, which includes the problems to be solved in the present invention, Koyama is merely disclosing performing a series of controls of the welding and cutting from tightening, by detecting reduction of the number of rotations of the inversion touch roller (13). Therefore, in Koyama, when the rear end side of the band is to be pulled back by the band pull-back means, an amount of the pull-back is not detected by detecting means in contrast to the present invention.

In addition, in Koyama, it is not decided that idle banding of the band is carried out when a length of the band thus pulled back is greater than a preset length of the pull-back of the band corresponding to a minimum packed article which can be packed, contrary to the present invention.

Furthermore, contrary to the present invention, in Koyama the rotation of the cam shaft is not temporarily stopped based on this signal so that the timing of the pressing to be carried out by the middle presser member after melting the superposing portion of the band by

means of the heater is not delayed for a predetermined time. Therefore, when idle banding is performed in the automatic banding packing machine of Shibasaki, it is not possible to easily remove the ring of a band, since the band is welded.

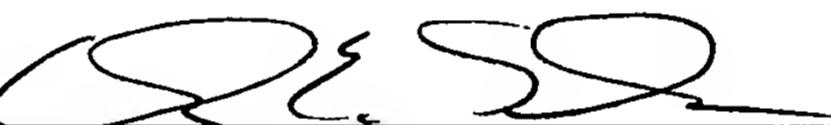
V. Conclusion

In view of the foregoing discussion relating to the construction and specific functions/effects of the presently claimed invention, Applicants respectfully submit that the subject matter of pending independent claim 1 would not have been obvious over the cited references. Reconsideration of the Examiner's rejection of pending independent claim 1 and allowance of the same are respectfully requested.

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